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(54) Slurry tanker
(57) A tanker vehicle, for example a tractor drawn slurry transporter for agricultural use, comprises an articulated boom (14,15) mounting a rotary submersible pump (23) at its outer end and supporting a duct (20 etc) part of which may be telescopic and part of which may be constituted by a section of the boom itself, forming an outflow connection at all positions of the boom

ERRATA

SPECIFICATION NO 2019346A

Page 2, line 66, *after CLAIMS insert 19.2.1979*

Page 2, line 112, *after drawings. Start new paragraph insert*
New claims or amendment to claims filed on 14 Jun. 79

Superseded claims NONE

New or amended claims:—

6. A vehicle as in Claim 1 wherein all or some part of the duct is formed from flexible tubing.
9. A vehicle as in any one of the preceding claims wherein the power transmission means includes a rotatably driven shaft extending along a part of the boom.
10. A vehicle as in Claim 9 wherein the drive means is connected to said shaft by roller chain and sprockets or Vee belts and pulleys extending along a part of said boom.
11. A vehicle as in any one of Claims 1 to 7 wherein the power transmission means includes a hydraulic motor driving said pump.
14. A vehicle as in any one of the preceding claims wherein the boom is mounted at the front of the tanker body.

Renumber claims 6, 7 as 7, 8 respectively

Renumber claims 8, 9 as 12, 13 respectively

Renumber claim 10 as 15

New claims or amendments to claims filed on 18 Jul. 1979

Superseded claim 10

New or amended claim:—

10. A vehicle as in claim 9 wherein the drive means is connected to said shaft by roller chain and sprockets or vee belts extending along a part of said boom.

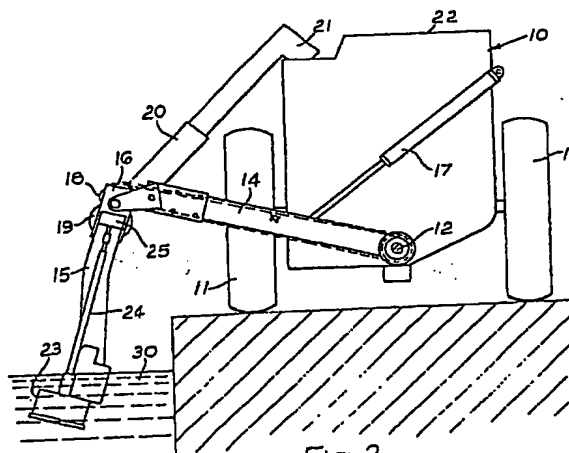
THE PATENT OFFICE
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(71) Applicants
Charles Edward Walley,
Cotton Abbots,
Waverton,
Chester CH3 5PH.
(72) Inventors
Charles Edward Walley
(74) Agents
Shaw bowker & Folkes

(54) Slurry tanker

(57) A tanker vehicle, for example a tractor drawn slurry transporter for agricultural use, comprises an articulated boom (14,15) mounting a rotary submersible pump (23) at its outer end and supporting a duct (20 etc) part of which may be telescopic and part of which may be constituted by a section of the boom itself, forming an outflow connection at all positions of the boom between the pump and the vehicle tank (10). Drive means, e.g. chain and shaft drive, is mounted on the boom to connect the pump to a P.T.O. shaft (12) or other power source so that the pump will operate at all positions of the boom.



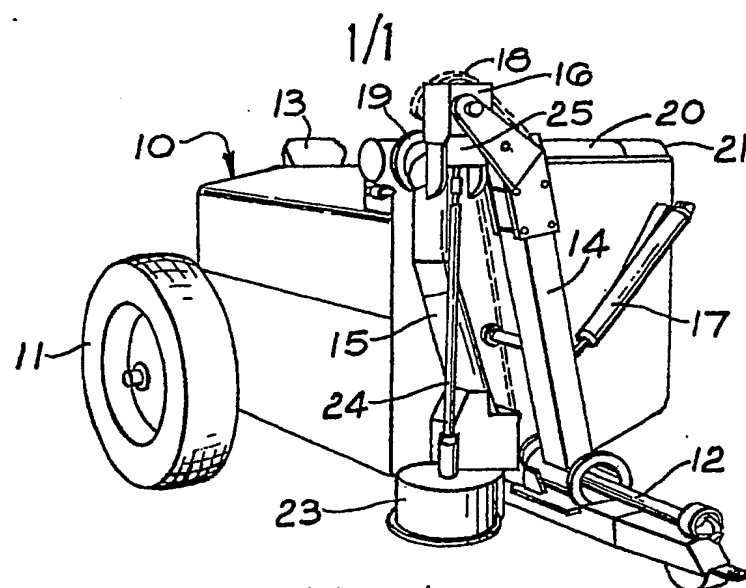


Fig. 1.

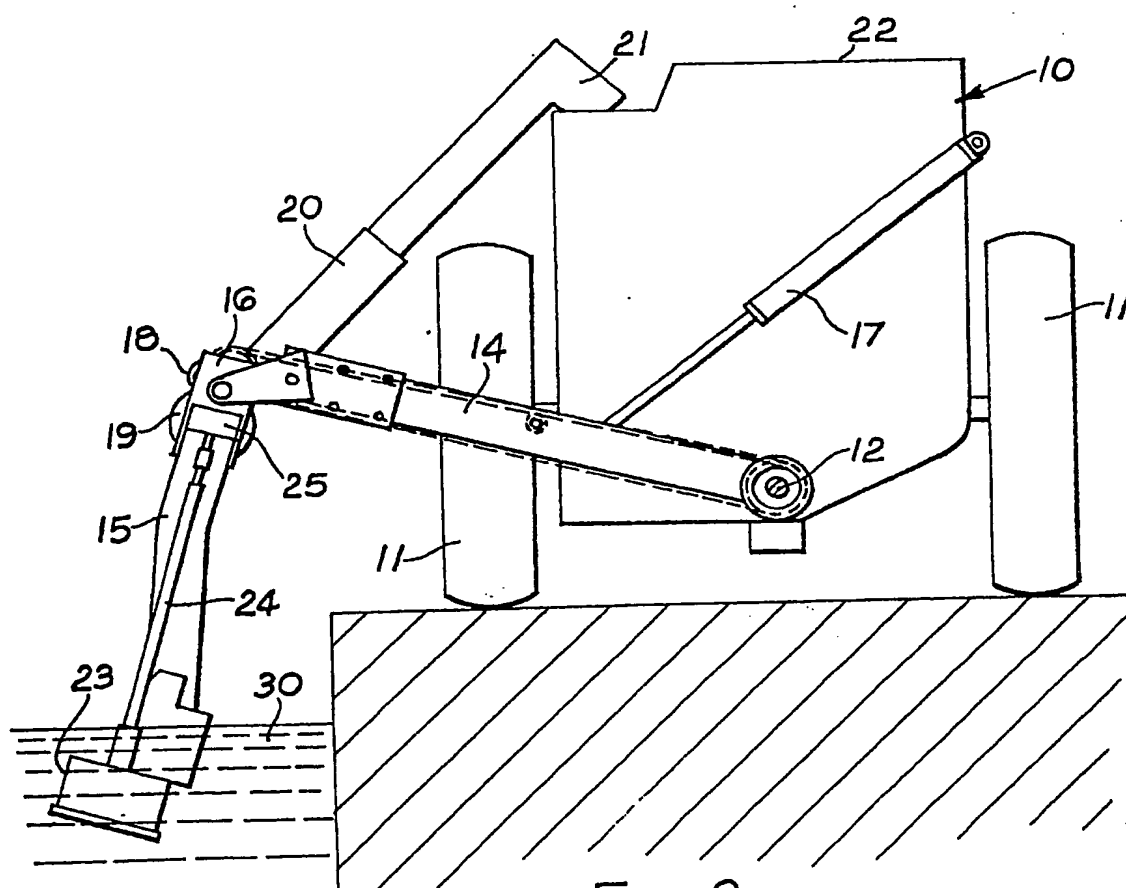


Fig. 2.

SPECIFICATION

Slurry Tanker

5 This invention relates to vehicle for handling liquids and/or semi-liquids such as effluent or slurry; particularly but not exclusively for agricultural use in connection with the collecting and transport for spreading or other disposal of slurry in liquid or
 10 semi-liquid condition accumulated into static lagoons or tanks, commonly below ground level, from livestock accommodation such as dairy-cow cubicles. Said slurry often contains some solids such as silage or other fodder, straw, etc., and may accidentally include such items as stones, pieces of wood and the like which are liable to stop or choke pumps or similar apparatus.

It is known to provide electrical or other powered pumps as fixed equipment at a static tank and while
 20 such installations have advantages particularly in large-scale installations they render operation somewhat inflexible as the pump cannot be used at other locations, and may cause problems of access and maintenance, e.g. if a totally submerged fixed pump breaks down or becomes choked or blocked. Any failure, even temporarily, in a slurry disposal system may have serious consequences, for example if uncontrolled overflow pollutes rivers and streams. It is also known to provide pumps mounted on a
 30 tractor or other powered vehicle but these have not always had sufficient capacity or been effective in handling all the conditions of slurry which may be encountered (slurry consistency is affected by numerous factors, e.g. rainfall, quantity of straw etc. used, and the type of animal being housed).

The object of the present invention is to provide pumping apparatus which is particularly effective and adaptable in use, capable of handling large volumes of slurry of widely varied consistency, and
 40 is resistant to choking and blockage, or if the latter should occur, is quickly and easily cleared.

According to the invention there is provided a tanker vehicle for collection and transport of liquids or semi-liquids including operatively powered drive means; a tanker body; an articulated boom having an inner end mounted on the vehicle; a rotary submersible pump carried on the outer end of the boom; a duct supported on or constituted by some part of the boom and arranged to provide an outflow connection from the pump to the tank throughout the range of articulation of the boom; and power transmission means drivingly connecting the pump to the drive means throughout said range of articulation.

55 One way of carrying out the invention is now described in detail with reference to the accompanying drawings wherein:-

Figure 1 is a perspective front view of a tractor drawn slurry transporter, and

60 *Figure 2* is a front end elevation of said transporter with slurry pumping apparatus positioned to pick up a load from a slurry tank below ground level.

The transporter is a tractor drawn two-wheeled trailer having a generally rectangular non-tipping
 65 tanker body 10 carried on large diameter wheels 11

at the extreme rear end for ease of movement over wet land and maximum weight transfer to the tractor driving wheels (tractor not shown). The spreading mechanism of the transporter is similar to that described in my British patent specification 1502805 comprising a longitudinal auger shaft 12 along the centre of the body bottom and driven through a dog clutch from the tractor P.T.O. in use. The auger urges slurry within the body 10 rearwards to a spreader pump (not shown) having a centrifugal impeller on the rear end of shaft 12 which will drive the slurry up a vertical duct at the rear end of the body for ejection from a fan-shaped discharge spout 13.

Slurry pumping apparatus is mounted on the front
 80 of body 10 and comprises an articulated boom having an inner rigid support section 14 pivoted at its inner end for angular movement co-axially with the auger shaft 12, and an outer section whose major part is in the form of a length of rigid duct 15. A
 85 box-like mounting formation 16 attached to the inner end of duct 15 is hinged to the outer end of section 14 for angular movement about an axis parallel to the auger shaft axis. Each section of the boom can be angularly displaced independently of and relative to the other and to body 10 by respective hydraulic rams operatively connected to the tractor hydraulic system; a first ram 17 extending between section 14 and body 10, and a second ram (not shown) housed within section 14 to act longitudinally thereof and
 95 having its outer end connected to a chain led round a guide sheave 18 and connected to a lateral projection on the mounting formation 16 of the outer section so that the latter will be angularly moved from the vertical as the chain is drawn inwards by
 100 the associated ram.

The inner end of the duct 15 terminates in a rearwardly directed elbow joint 19 which is swivel connected to a similar forwardly directed elbow at the outer end of a telescopic duct 20. The inner end of duct 20 is provided with a downwardly directed spout 21 which hooks over the rim of a transverse inlet opening 22 at the top front end of tank 10. With the boom in the folded condition shown in *Figure 1* telescopic duct 20 is retracted horizontally to lie
 110 along the tank opening 22 transversely of the transporter. When the boom is extended to an operative position as shown in *Figure 2* duct 20 is drawn laterally outwards and downwards so that the telescopic section is extended and flow from said duct will be delivered from spout 21 into opening 22 at the corner of the tank adjacent to the boom.

The outer end of the boom mounts a submersible pump comprising a drum-shaped pump housing 23 within which is a rotary centrifugal pump impeller mounted directly onto a shaft 24 extending alongside duct 15 to an angle gear box 25 mounted on formation 16. Drive to gearbox 25 is taken from shaft 12 on the power input side of the auger dog clutch by roller chain and sprockets or, possibly, Vee belts running along inner section 14 and is arranged so that drive is transmitted regardless of the angular position of the boom sections.

A splined coupling adjacent to gearbox 13 can be released enabling the impeller and shaft 24 to be withdrawn bodily out of the pump inlet opening in
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housing 23 (said opening being the full diameter of housing 23) thus giving easy access for clearance of blockages or jamming or the repair or maintenance of the pump components.

- 5 In use, the transporter is driven to the side of a slurry tank or lagoon 30 and the boom is extended and lowered by actuation of the rams so that outer section (i.e. duct 15) is more or less vertical and pump housing 23 is submerged below the slurry level. The P.T.O. is then engaged so driving the pump and drawing the slurry rapidly through the large inlet opening of housing 11 and driving it along the substantial diameter ducting 15 and 20 leading to tank 10, the dog clutch being disengaged so that the auger and spreader pump are not running during loading.

- When a full load has been taken on the boom is folded to the position shown in Figure 1 so raising pump housing 23 and bringing it inboard to the front of the transporter body and well clear of gate posts and other obstructions; and the transporter is then driven to the field or other discharge area, the shut-off flap is opened, and discharge and spreading is effected by the operation of the auger and the spreader pump extremely speedily as described in my said patent specification 1502805. It has not been found necessary to provide for disconnection of drive to the pick-up pump while spreading takes place, the latter is allowed to "free wheel" adequately protected by housing 23.

- However, in some constructions the pickup pump, auger, and/or spreader pump or other discharge means may be driven independently, for example by individual hydraulic motors powered from the tractor hydraulic system.

- The use of rigid swivel jointed and telescopic ducting 15, 21 between the pickup pump and the tank is advantageous in that the construction is durable and the weight and problems of support are considerably less than if equivalent bore flexible tubing was employed, although it is contemplated that the latter might be used in some applications to form all or part of the duct. The swivel joint and telescopic connections of the duct need not be absolutely fluid-tight and do not have to maintain a vacuum, thus they can be fairly loose for freedom of movement of the boom as leakage is negligible in practice.

- The rearward offset provided by the elbow swivel jointing between duct 15 and telescopic duct 20 facilitates neat folding of the boom as the sections of the latter can swing inwards in front of the tank while carrying telescopic duct 20 laterally in line with tank opening 22.

- 55 The transporter provides particularly efficient and speedy collection and spreading coupled with flexibility of operation as one piece of apparatus can serve several small or dispersed slurry tanks e.g. around different groups of farm buildings or on different farms, so reducing need for costly fixed capital equipment. Even if large scale slurry processing installations are used the invention will provide a valuable standby if a fixed pump should break down or other equipment becomes inoperative.

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CLAIMS

1. A tanker vehicle for collection and transport of liquids or semiliquids including operatively powered drive means; a tanker body; an articulated boom having an inner end mounted on the vehicle; a rotary submersible pump carried on the outer end of the; a duct supported on or constituted by some part of the boom and arranged to provide an outflow connection from the pump to the tank throughout the range of articulation of the boom; and power transmission means drivingly connecting the pump to the drive means throughout said range of articulation.
2. a vehicle as in Claim 1 wherein the boom has an inner and an outer rigid section and is provided with means for selectively adjusting the angular relationship of the sections one to the other, and the angular relationship of the entire boom to the vehicle.
3. A vehicle as in Claim 2 wherein said duct is constituted in part by a major portion of one of said boom sections.
4. A vehicle as in Claim 3 wherein said major portions is of the outer section, and a further part of said duct connecting the inner end of said portion with the top of said tank is telescopic.
5. A vehicle as in Claim 3 or 4 wherein said duct includes a swivel elbow joint adjacent the centre of relative articulation between said boom sections.
6. A vehicle as in any one of the preceding claims wherein said pump includes a rotary centrifugal impeller in a housing at the outer end of the boom, the axis of said impeller extending longitudinally of said outer end.
7. A vehicle as in Claim 6 wherein said impeller can be withdrawn axially through the inlet opening of said housing.
8. A vehicle as in any one of the preceding claims in the form of a trailer vehicle, said drive means being powered from a tractor drawing the vehicle in use.
9. A vehicle as in Claim 8 including spreader mechanism for discharge of liquid from the tank.
10. A tanker vehicle substantially as hereinbefore described with reference to and as shown in the accompanying drawings.